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EMPIRICISM AND PHYSICALISM

By B. v. Juhos

THE Physicalists' theory of truth, as formulated by Carnap and Neurath, has been expounded by Dr. Hempel¹ in *Analysis* (vol 2, no 4). Within the Viennese Circle Physicalism has led to a division of opinion, which mainly finds its expression² in the fact that the Physicalists are reproached by their opponents with having broken with the principles of Empiricism. This charge is denied by Carnap³ and Neurath⁴ in their recently published papers; but I do not consider their counterarguments conclusive, and will endeavour to give my reasons for this opinion. This occasion will also serve to deal with Dr. Hempel's theories.

We shall solve our problem by examining whether the mode of speech of Physicalism is compatible with that of empirical science in its present state.

Statements of empirical science are tested by deducing from them propositions in the form of observation-statements and comparing these with observation-statements that have been actually established.⁴ In case the compared statements agree, we speak of "assertion" of the statements which were to be tested. What happens, however, if the compared statements—to put it according to Carnap, the deduced statement in form of a protocol-statement, and the protocol-statement which is actually made—contradict each other? The Empiricist would say in this

¹See C. G. Hempel: "On the logical positivists' theory of truth" in *Analysis* 2, 4.

²See M. Schlick: "Über das Fundament der Erkenntnis" in *Erkenntnis* 4, 2 and his recently published paper "Facts and Propositions" in *Analysis* 2, 5, and B. Juhos: "Kritische Bemerkungen etc." in *Erkenntnis* 4, 6.

³R. Carnap: "Logische Syntax der Sprache", Vienna 1934, p. 243 ff.

⁴O. Neurath: "Radikaler Physikalismus und 'wirkliche Welt'", in *Erkenntnis* 4, 5.

⁵R. Carnap: l.c., p. 245.

case that the proposition obtained by observation has refuted the one to be verified, meaning that the statement subjected to the test is to be altered in such a way that its agreement with the statement gained by observation is brought about. In accordance with this point of view the latter must by no means be altered in order to remove the incompatibility, or else the expression "the statement obtained by observation has refuted the one to be tested" would obviously be inadmissible.

In opposition to this the Physicalists speak of "refutation" (and accordingly also of "assertion") in a way which is incompatible with the above mentioned empiricist mode of speech. Carnap, it is true, is also of opinion (l.c., p. 245), that in case of non-accordance it is the "actually" made protocol-statement that refutes the deduced statement in form of a protocol-statement, adding, however, that under certain circumstances it might be permissible, to alter also the "refuting" statement, which was obtained by observation, in order to remove the incompatibility, for there are no strict rules prohibiting the alteration of any propositions.

Here we only wish to assert, that in opposition to empiricist usage Physicalism means by "refutation" a symmetrical relation in the sense, that either of two contradictory statements may, as a matter of principle, be altered in the same way.

To be sure, we find it hard to understand why Carnap for all that definitely contrasts two kinds of protocol-statements with each other, viz. the deduced statements in form of protocol-statements, and the actually made protocol-statements. A remark to that effect we find in Carnap's book, p. 244 : it is for the observing Physicists to determine, which of the statements which have the form of protocol-statements, and whose form is admitted by syntax, should now really be established as true protocol-statements. We might think that Carnap indeed was thus meeting Empiricism half way. As soon as the truth of protocol-statements is determined by observation, there is no doubt about their being qualified to verify or disprove other statements. But then these observation-statements, when they contradict other propositions of the scientific system, may by no means be declared false, for their truth, according to the above mentioned passage in Carnap's book, has already been determined by observation (i.e. by "actual" establishment), whereas the truth of the other propositions, which, in order to control

them, are being compared with the protocol-statements obtained by observation, is still indefinite and is to be tested by that very comparison. But further on (l.c., p. 245) Carnap, as has been mentioned before, expresses opinions, which contradict the consequences of his assertion, and which make it entirely unintelligible, why he lays so much stress on obtaining protocol-statements by means of observation ("actual" establishment). For if the deductions from a theory which is to be tested contradict the actually made protocol-statements, while we, however, do not wish to relinquish the theory, then, according to Carnap we need only change the statement gained by observation into another protocol-statement in such a way that the incompatibility is removed and the assertion of the theory is attained. Why then introduce the observation? If we are allowed to alter the propositions obtained by observation as it pleases us, in case they contradict some theory, then we might as well have formulated them to begin with in such a way that they assert our theory. This proves that the way in which the Physicalists speak about assertion and refutation renders possible the mode of speech, that just as observation-statements are able to refute a system of hypotheses, a hypothetical system is able to refute statements obtained by observation. This is reminiscent of Hegel's dialectical conception of truth and disagrees, in my opinion, with the empiricist mode of expression.

This opposition between Physicalism and Empiricism becomes still more distinct as soon as linguistic rules themselves are dealt with, which according to the opinion of Empiricists forbid the alteration of certain statements.

Observation-statements such as "I see red and blue side by side", "in the yellow I see a dark line", "I feel pain", "I hear a loud, high note" etc., admit of no alteration according to Empiricism, and for the following reasons: we formulate statements which have first to be tested, with the reservation that we may possibly have made a mistake regarding them. These are all statements of a hypothetical character, for instance: "in the adjoining room there is a table and three chairs". It is by no means impossible that we have made a mistake regarding this proposition. If it results from the test that we have in fact made a mistake, then the statement has to be altered, or perhaps we have to reject it altogether.

Now there are statements of which it is impossible with any

sense to say, as far as we use the terminology of our empirical science, that it is possible to make a mistake concerning them. These are observation-statements of the above-mentioned kind. When I make the statement "I feel pain" somebody may doubt my having spoken the truth but under no circumstances can anyone, acquainted with the terminology of empirical science retort that in saying so I have made a mistake. The language of empirical science, as it is taught to-day, excludes any possibility of using such a mode of speech. In stating "I feel pain" I may have said something wrong, not because I have made a mistake, but because I had the intention of telling an untruth, i.e. because I wanted to lie. With propositions of that sort I assert either a true thing or an untrue thing, both intentionally; of the third possibility, i.e. that I may have made a mistake in these statements, empirical science consequently can make no sense.

While formulating a proposition such as "I feel pain" I know already whether I have made a true or a false statement. In this respect a mistake being out of the question, as has been said before, there is no reason for reserving a possible alteration of these statements. They are unalterable, for the possibility of error concerning them does not exist, so there is no ground for the possibility of a further test, the result of which would have to decide about the alteration.

This opinion, which is based on the mode of speech of empirical science and which results from the privileged position of a certain class of propositions, is attacked by the Physicalists. For it violates the fundamental thesis of the parity of *all* statements, according to which all statements, without exception, are alterable as a matter of principle. The Physicalists believe that they are able to prove that also such propositions as "I see blue", "I feel pain" etc., may as a matter of principle be tested and altered. It will appear, however, that they succeed in proving this only after having relinquished the rules of Empiricism.

Statements of the kind mentioned above, according to Neurath⁵ and Carnap⁶, must be interpreted according to extreme behaviourism; so that the statement "I feel pain" has no other meaning than "I am displaying some outward attitude

⁵Neurath: "Einheitswissenschaft und Psychologie", Vienna 1933.

⁶Carnap: "Die Aufgabe der Wissenschaftslogik", Vienna 1934, "Psychologie in physikalischer Sprache" in *Erkenntnis* 3, "Die physikalische Sprache als Universalsprache der Wissenschaft" in *Erkenntnis* 2.

or other, as for instance moaning, grimacing etc. ; some nervous process or other in my body may be noticed besides." All these characteristics are undoubtedly testable, and according as they are noted or not the statement " I feel pain " is retained or altered. In this way it is proved that statements previously designated by us as unalterable can also as a matter of principle be altered.

This proof would stand the test in case the equivalence of the proposition " I feel pain " with the statement that asserts the existence of the corresponding " behaviourist " attributes was based on logic. But this is not the case : this equivalence is only empirical. According to our experience it is a fact that, when I assert " I have pain ", the relevant " behaviorist " data are to be observed in relation to me. But I am justified in making the statement " I feel pain " and in maintaining it as true even if the corresponding " behaviorist " data can not be detected. I do not make a contradictory, but a possibly true statement, if I allege that I suffer pain without any visible sign of pain. And therefore it is not the statement " I feel pain "—we will call it *p*—that is verified by the second testing of the characteristics, but always another proposition, which asserts for a definite case the existence of a synthesis, which was frequently observed, of the establishment of *p* itself with its outer characteristics. More about this hereafter.

The incompatibility of the empiricist mode of speech and the extreme behaviorist interpretation of the above mentioned kind of propositions can also be shown in the following way. There is no doubt that there are people who when questioned about the behaviorist criteria of pain would not be able to state them. Is it possible that those people, when complaining about pain, do not mean anything with any sense ? Or did people mean anything else when they said they were suffering pain in those times when nerves were not yet discovered and nobody knew that nervous reactions were the empirically decisive criteria of pain, than we do to-day ? I consider these consequences absurd. But still less acceptable is the following consequence, resulting from the physicalist point of view. Supposing I complain of head-ache, a Physicalist, having examined me, can not find any " behaviorist " data (nervous reactions included), that he sought. And he says to me : " Cheer up, you have made a mistake, you have not got a head-ache ! " This statement of the Physicalist has no

meaning for the Empiricist. This is the best proof, that the Physicalist breaks with the rules of language of empirical science. An Empiricist in the above mentioned case would possibly reproach me with having told him a lie about my pain, but the rules of his language exclude the possibility of calling my statement an error.

From this side the Physicalists attack our unalterable statements with another argument, in order to attain the general acknowledgement of their thesis of the equality of all propositions. We shall see, that this attempt also offends against the rules of the empiricist mode of speech.

According to the Physicalists such statements as "I feel pain", as far as they are generally intelligible, are not only always translatable into statements about "behaviorist" symptoms, but—consistently generalising the extreme behaviorist program—the very character of these symptoms is attributed to them⁶; the result being that if such a statement is considered true we mean that the before mentioned linguistic symptoms have appeared together with certain other exterior characteristics. False we call such statements, if the appropriate linguistic symptom appears, not with the characteristics known to us from experience, but without them, possibly with certain others. Accordingly such a proposition as "I feel pain" would be false or true in the same sense as for instance the indications of a clock that is a good or a bad time-keeper, which naturally can always be tested and, according to the results of the test are accepted or altered. So the possibility of altering our statements seems to be evident.

This conception is faced by difficulties, the moment it is tested according to the mode of speech of our empirical science. For there is no doubt that by saying "I feel pain" some may tell a lie. But shall we ever seriously be able to blame a clock, a barometer or thermometer for having lied to us? At best in a metaphorical sense. If we go by a clock, and miss the train in consequence of its false indication, it is certain that we shall not say the clock has told a lie, just as we do not reproach a barometer "for having lied to us" if it prophesied fine weather whereas storm and wind have set in. The Empiricist will never speak of lies in such a case, it being against the rules of his terminology. For the same reason it is impossible for him in the above men-

⁶Carnap: "Psychologie in physikalischer Sprache" in *Erkenntnis* 3, 140.

tioned cases to speak of an "error" on the part of the instruments. Our unalterable propositions for him are not characteristics arising from a certain empirical lawfulness, but signals which are used according to rules clearly defined beforehand. The Physicalist, on the contrary, must in cases of the above mentioned type reproach the instruments in question with a lie or an error; he is forced to do so if he wishes to obey the rules of the language employed by him. It again becomes obvious that the physicalist's reinterpretation of the statements which we have designated as unalterable offends against the mode of speech of empirical science.

But there is always an objection left for the Physicalists, by means of which they deny that the "unalterable" statements, even if they are logically possible, are qualified to play a part in science⁷. Even if it is impossible for us to make a mistake in such statements as "I see orange and yellow side by side", "I have a head-ache" etc., and their truth does not depend on any test, these statements are for that very reason not intersubjectively controllable, but always only for the one person who has made them. But a statement not verifiable for everybody is not generally comprehensible and consequently does not count in empirical intersubjective science. Thus, if I make the statement "I feel pain" and refuse the physicalist behaviorist interpretation, it is not intelligible for anybody but me. Even if I am already aware while making them whether I am making a true or a false statement, it is only I myself who am sure of it, and there is no method of verification by means of which the truth of my assertions can be controlled by others.

The "test" of such statements used in practice, which consists in the investigation whether the corresponding "behaviorist" characteristics can be observed, is, as has been mentioned before, no verification of the "unalterable" statements. From experience we know that if a person complains of a head-ache we can observe in him certain exterior characteristics or nervous reactions. Further we also know from experience, that the proposition "I feel pain" was in most cases withdrawn as a lie by the person who had asserted it, whenever these "behaviorist" characteristics were not to be discovered. Therefore the so-called behaviorist test of an unalterable statement inquires if our

⁷*Neurath*: "Radikaler Physikalismus u. 'wirkliche Welt'" in *Erkenntnis* 4, 5.
Hempel: *Analysis* 2, 4. 56

supposition that the data referred to are there will be proved true or false, and in case they are not if the person that has made the statement will also withdraw it as a lie. This supposition of ours is verified by the behaviorist test ; but logically it is impossible for the statement itself " I feel pain " to be proved false or true, i.e. be verified, for, whatever the result of the test may be, I may after all have told the truth in this proposition. For the truth of this statement is independent of the behaviorist test. If such statements can therefore not be controlled by other persons, on the other hand the person who has made the statement knows " directly " i.e. independently of any test, whether he has made a true or a false statement.

But it is upon this that the above mentioned objection of the Physicalists is based. If the truth or falsity of unalterable statements can only be determined by the person making them, then these statements are totally incomprehensible for all others. For I can only understand a statement which I am able to verify. If somebody declares he has a head-ache, and I can not prove whether he has told the truth or not, I can not understand at all what he means by this assertion. This objection of the Physicalists does not work either. For we must distinguish : is it only practically impossible to verify a statement, or is it unthinkable, i.e. logically impossible for us to do so ? Generally a statement is only unintelligible if it is logically impossible for everyone to test it. As soon as conditions are imaginable, under which the truth of a statement becomes determinable for everybody, the statement is already generally intelligible, even if the fictitious circumstances do not really exist.

Corresponding imaginable circumstances may be quoted for our unalterable statements. Supposing a blind person, whose optic nerves do not react to physical light-stimuli, always had the colour-experience " blue ", when a seeing person perceived the same colour. It is not unthinkable for us that a blind man should experience colours. We often see colours in our dreams, and surely not under the influence of physical light-stimuli. Now, if the person who sees makes the statement " I see blue ", then the blind person is able to test this proposition directly, i.e. independently of any behaviorist test. It would be out of place to object that it is not the " same " blue the two are experiencing. For it is a matter of linguistic convention when we speak of an experience as being the " same ". We can easily agree about

the assertion that we are able to say of the two above mentioned persons that they experience the "same" blue. The chief thing, however, is, that in the supposed case the possibility of "direct" control (control without a behaviorist test) of an unalterable statement even by another person, would be realized. And these relations can naturally be imagined between any other persons, and not only for the statement "I see blue" but in the same way for all other unalterable statements. Hereby the logical possibility of verifying these statements is proved, and the consequence is that they are generally quite intelligible, and indeed are understood by everyone. Therefore we are not forced at all to replace the mode of speech of empirical science, which does not permit the alteration of such statements as "I see blue", "I feel pain" etc., by the physicalist mode of speech which demands the alterability of all statements, and is incompatible with the former, in order to attain general comprehensible meaning for the above mentioned propositions.

Neurath⁸ believes he can give examples, in which the alteration of our unalterable statements also becomes, according to his opinion, indispensable. Hempel⁹ gives an example of this sort. It is imaginable that somebody protocols the statement "I see this patch entirely dark-blue and also entirely light-red". No doubt this statement belongs to our unalterable statements, for all that it is indispensable that it should either be altered or scrapped entirely. For it contains a contradiction. By this Neurath seems to have demonstrated that even the statements, which we declare unalterable are modified under certain circumstances, and that they must consequently be alterable. But if we regard this example more closely, we perceive at once that the truth or falsity of this statement also is independent of any test. It is false in every case. He who formulates this statement knows the moment he is doing so that he has made a false statement, and it is logically out of the question that he is mistaken in this. But where a mistake is out of the question in the making of a statement there is no sense in reserving the alterability of the statement. For in such a case I have either purposely made a true, or purposely made a false statement. There seems to be no sense in introducing the mode of speech that we formulate a false statement purposely and consciously only for the purpose

⁸Neurath: "Protokollsätze" in *Erkenntnis* 3, 209.

⁹Hempel: *Analysis* 2, 4, 53.

of declaring it false afterwards, i.e. to reject it. If this also is described as "alteration" quite another thing is obviously meant here than the alteration of an error. The example given by Hempel can not be an error, whoever formulates it must know, in case he understands the language in which he expresses himself, and is fully acquainted with it, that he has made a false statement. That he can later on describe this proposition as false, i.e. scrap it entirely or partially, is a triviality and absolutely different from the alteration of an error, which never is a triviality. And if we have declared certain statements as unalterable, we did not mean anything but that these statements can never be errors and can therefore not be altered like errors. And in this sense also the statement mentioned by Hempel "I see this patch entirely dark-blue and also entirely light-red" is *not* alterable. Consequently the other examples of Neurath, being of the same kind, do not prove that our unalterable statements are bound to be altered under certain circumstances.

Finally we want to discuss the reflection also submitted by Hempel¹⁰, by means of which the Physicalists try to meet a difficulty into which they are led by their conception. According to the Physicalists all statements are equal in principle, i.e. they are equally alterable. Consequently the protocol-statements which are to verify a scientific system may be altered, or replaced by other adequate protocol-statements, in case they contradict this system. But then we can imagine an unending number of incompatible sciences for which we can construct the corresponding verifying protocol-statements. How can it be explained, or justified, that we in reality consider as true one single system, viz. the empirical science of to-day, and reject as false all other systems which are incompatible with it, although these are equally verified by protocol-statements constructed and added later?

To be able to appreciate fully in what way the Physicalists endeavour to remove this difficulty, we must mention a special postulate of Physicalism. Carnap¹¹ has formulated the distinction between the formal and the material mode of speech. The always inexact material mode of speech, according to which e.g. statements express facts, may lead to pseudo-problems. So, for instance, when it is said that empirical statements become verified

¹⁰Hempel: *Analysis* 2, 4, 56-57.

¹¹Carnap: "Logische Syntax", Vienna 1934. See also Hempel: *Analysis* 2, 4, 54.

by their comparison with "facts". Such pseudo-formulations according to the Physicalists are excluded automatically as soon as we use the formal mode of speech. Accordingly, we do not say a proposition expresses such and such a fact, but that it contains such and such words or expressions. In many cases this transformation may be advantageous, but we shall see directly that it is impossible for the Physicalists to prove the distinction of our empirical science from all other possible systems in the formal mode of speech. And this logical—therefore insuperable—difficulty just at this point seems to me to be fatal for the physicalist conception. For as a result of this the fundamental physicalist thesis of the parity of all statements becomes invalid.

Concerning the special position of "true" science, as opposed to the merely possible, Hempel, closely following Carnap, says (p. 57): "The system of protocol statements which we call true, and to which we refer in every day life and science, may only be characterized by the historical fact, that it is the system which is actually adopted by mankind, and especially by the scientists of our culture circle. . . ." Here Hempel is speaking of a certain historical "fact". Why does he here, as well as Carnap¹² in the same connexion, employ the material mode of speech? That this is not a mere chance is clearly seen, if we transform Hempel's arguments into the formal mode of speech. Instead of speaking of the "fact" that the scientists of our cultural circle acknowledge the protocol-statements of our scientific system, we will speak of the statements that register these facts, and which accordingly contain the respective terms. Then Hempel's argument is formulated thus: the system of protocol-statements that we call true is characterized by the quality that certain protocol-statements belong to it, which assert that this very system of statements is acknowledged as true by the scientists of our cultural circle. Here the objection arises of itself that an infinite number of systems of protocol-statements which are not to be contradicted might be quoted, all of which contain those particular statements, which characterize as true the system of protocol-statements of our science, but for the rest are incompatible with this system. And all these imaginable systems have to be considered true exactly in the same sense as our true science. If we consistently obey the physicalist postulate, to

¹²Carnap: "Erwiderung etc." in *Erkenntnis* 3, 179-180.

employ only the formal mode of speech, the argumentation of the Physicalists themselves leads to the very difficulty which it was to remove. In order to avoid this circle, Carnap and Hempel did not avail themselves of the formal mode of speech, which can therefore scarcely be a matter of chance. But if, for this one argument, it is not admitted that it is translatable into the formal mode of speech, then we are no longer Physicalists. For the statements expressing the above mentioned historical "facts"—in this case it is impossible to express oneself differently—are distinctive statements, which cannot be verified by comparison with other statements, but perhaps even by comparison with *facts*, and are unalterable. This breaking of the Physicalists with their own theses Hempel believes he can explain by the remark (p. 57, remark 6), that Physicalism was not a "pure coherence-theory", but a "restrained coherence-theory of truth". Strictly he ought to call it an "inconsistent coherence-theory of truth".

I believe that I have shown that the physicalist mode of speech is incompatible with that of Empiricism. If we strictly adhere to the physicalist theses, we come on the one hand to formulations which the Empiricist eliminates as being meaningless; and on the other hand, while trying to verify the special position of true science in relation to the merely imaginable one, we enter a circle, a pseudoformulation, that can only be avoided by a return to the empiricist mode of speech, which means giving up the physicalist (formal) mode of speech. As a matter of fact, the Physicalists on this point, as we have seen, become untrue to their own mode of speech. The phrases which they employ here are expressions of the early empiricism. We have acquired our formulations by a linguistic-logical analysis, and should therefore like to call the views represented here "*logical Empiricism*".

Vienna, May 1935.

SOME REMARKS ON 'FACTS' AND PROPOSITIONS

By CARL G. HEMPEL

1. In a recent article in *Analysis* (vol 2, no 5) Prof. Schlick traces the outlines of his view concerning the relationship of propositions to 'facts.' In this account, Prof. Schlick makes a contribution for which we must be grateful to elucidating some essential points of his article "Das Fundament der Erkenntnis" (*Erk.* 4, 79), which occasioned a logical controversy, the fundamental ideas of which I tried to characterize in my note "On the Logical Positivists' Theory of Truth" (*Analysis*, vol 2, no 4).

In his paper, Prof. Schlick raises certain objections to some of the considerations which I sketched in my article and which correspond to Dr. Neurath's and Prof. Carnap's view; he gives his objections the form of questions, which may be summed up by asking: What harm is there in saying that propositions are compared with 'facts,' and that true propositions express 'facts'? To this question I shall try to reply.

2. Prof. Schlick illustrates the character of the comparison between a proposition and 'facts' by means of a very instructive example. But I think that in an essential respect his account is not quite adequate.

For on the one hand Prof. Schlick expressly describes propositions as empirical objects (of a special kind) which may be compared with any other empirical object. So far I fully agree with him.¹ But if we take him at his word, we must expect that the proposition he chooses as an example will be tested by comparing the *physical object* (consisting of ink-symbols) "This cathedral has two spires" (or a similarly shaped physical object which is to be found in Prof. Schlick's Baedeker), with another physical object called the cathedral. Such a comparison may very well be realised (it would lead to such statements as: The

¹Prof. Schlick's new explanations (pp. 66-67) show that concerning the character of propositions, the difference between his and Dr. Neurath's view is not nearly so great as it might seem from Prof. Schlick's article in *Erkenntnis*; his recent formulations reveal almost a verbal congruence with certain statements of Dr. Neurath's in *Erkenntnis* 4, especially pp. 355-56, which Dr. Neurath thought to be in contradiction to Prof. Schlick's view, and likewise with my remarks in *Analysis* 2, 4, pp. 54 and 57.

It might have been better to employ the term 'sentence' to designate the series of symbols we are speaking of; for the English word 'proposition' is also used with other meanings. But as the latter term has been employed in the two articles in *Analysis* which we refer to, I have refrained from replacing it by the univocal word 'sentence'.

proposition contains more parts, called "words", than the cathedral has spires); but evidently it does not permit us to test the proposition (indeed, there is no specific 'correspondence' between the two compared physical objects). But here Prof. Schlick introduces a second interpretation of the comparison, saying that "it is done by looking at the cathedral and at the sentence in the book and by stating that the symbol 'two' is used in connection with the symbol 'spires', and that I arrive at the same symbol when I apply the rules of counting to the towers of the cathedral" (p. 67). Here, he evidently compares the proposition in his Baedeker with *the result* (not with the act!) of his counting the spires; this result may have the form "I now see two spires" or something like that, but in any case it is a second *proposition* with which the first is compared. (And now there really is a certain congruence, both the propositions containing the word 'two'.)

Thus Prof. Schlick's example reveals that speaking of a "comparison between a proposition and 'facts'" is nothing but an abbreviated and convenient method of describing a comparison between certain propositions; (and just this is meant by saying that in "a logical respect" "propositions cannot be compared to anything but propositions"). Such a comparison *refers to the logical relations* which hold between the compared propositions.

In order to find out, e.g., if a certain hypothesis *h* is confirmed or falsified by the 'observed facts' with which it is compared, one has to ascertain, if the observation-statements are *compatible* with (or even *deducible* from) *h*, or if they *contradict* *h*. Such a logical (syntactical) examination of propositions may be performed, as Carnap has shown in his "Logische Syntax der Sprache" (cf. also "Philosophy and Logical Syntax", London, 1934), without knowing the meaning of the propositions, by a mere comparison of the symbols which the propositions are composed of. (Stating that both the propositions mentioned above contain a sign shaped 'two' is an example of this kind of comparison.)

3. But furthermore, Carnap has shown that the logical relations which hold between two propositions depend upon the syntactical rules of the language which we choose. A proposition *p* may be deducible from a proposition *h* with respect to one system of rules, and not deducible from *h* with respect to another one. Therefore the result of what is called a "comparison

between propositions and 'facts'" depends upon the syntax of scientific language—a circumstance which need not necessarily, but will at least very easily be veiled by the material mode of speech, the latter evoking the imagination that the 'facts' with which propositions are to be confronted are substantial entities and do not depend upon the scientist's choice of syntax-rules.

4. This point is also fundamentally connected with the question of the 'structure of facts'. If one admits this expression, it seems to be legitimate, e.g. to ask, if the structure of facts admits only the occurrence of rational values of the different coefficients of physical state, or if, on the contrary, the old principle "*natura non facit saltus*" is valid in the sense that also irrational values are physically possible? And if one thinks, further, that the structure of propositions must be in a certain way isomorphous to the structure of facts, one has to ask: Have we to introduce the system of real numbers in order to give a true image of the structure of facts? But both these questions are pseudoproblems; for it is impossible to imagine an experience which might furnish a decision by falsifying one of the two possibilities. It is a question of syntactical convention whether to admit or to exclude the occurrence of irrational-number-symbols, and thereby to stipulate a rational or irrational metrical structure for 'facts'.

5. In Carnap's and Neurath's theory of science, the empirical character of scientific research is fully maintained. It is expressed by emphasizing that scientific propositions are tested by such statements (often observation-statements) as have been produced or adopted by instructed observers or "scientists". (Giving someone "deictic definitions", of the kind Prof. Schlick speaks of, is a special way of instructing or "conditioning" him for the production of observation-statements.)

But I think it is not quite harmless (though, of course, not "false" either) to say that those observation-statements (and the statements supported by them) "express 'facts'"; for this term indicates something which is once for ever fixed with all its characteristics, whilst it is essential for the system of scientific statements that it may always be changed again, that no proposition is adopted once and for all, and in addition that the adoption of any observation-statement has, after all, the character of a *convention*. But even if one denies this, as Prof. Schlick does, it is not harmless to say that "propositions express 'facts'."

For one system of observation statements (or other basic statements) is compatible with many different systems of physical statements (see *Analysis* 2, 4, p. 52), so that any of the ordinary physical statements, even such as "This is a piece of iron," is a hypothesis the adoption of which depends in the end upon a convention.

And the character of statements which are adopted by a convention evidently does not admit of such questions as : Are there statements which express facts adequately, which are absolutely true (are perhaps the "Konstatierungen" of this kind) ? Prof. Schlick had dealt with questions of this type, and I therefore put forward in the paper which has been mentioned certain scruples concerning the formulation that "propositions express 'facts'".^a

^aSome months ago Dr. Popper published a most suggestive book "Logik der Forschung" (Springer, Wien, 1935), in which he examines, amongst other questions, some of the problems touched in the present discussion and gives a detailed account of the conventional character of the basic propositions in science.

Brussels, May 1935.

CONGRÈS INTERNATIONAL DE PHILOSOPHIE SCIENTIFIQUE

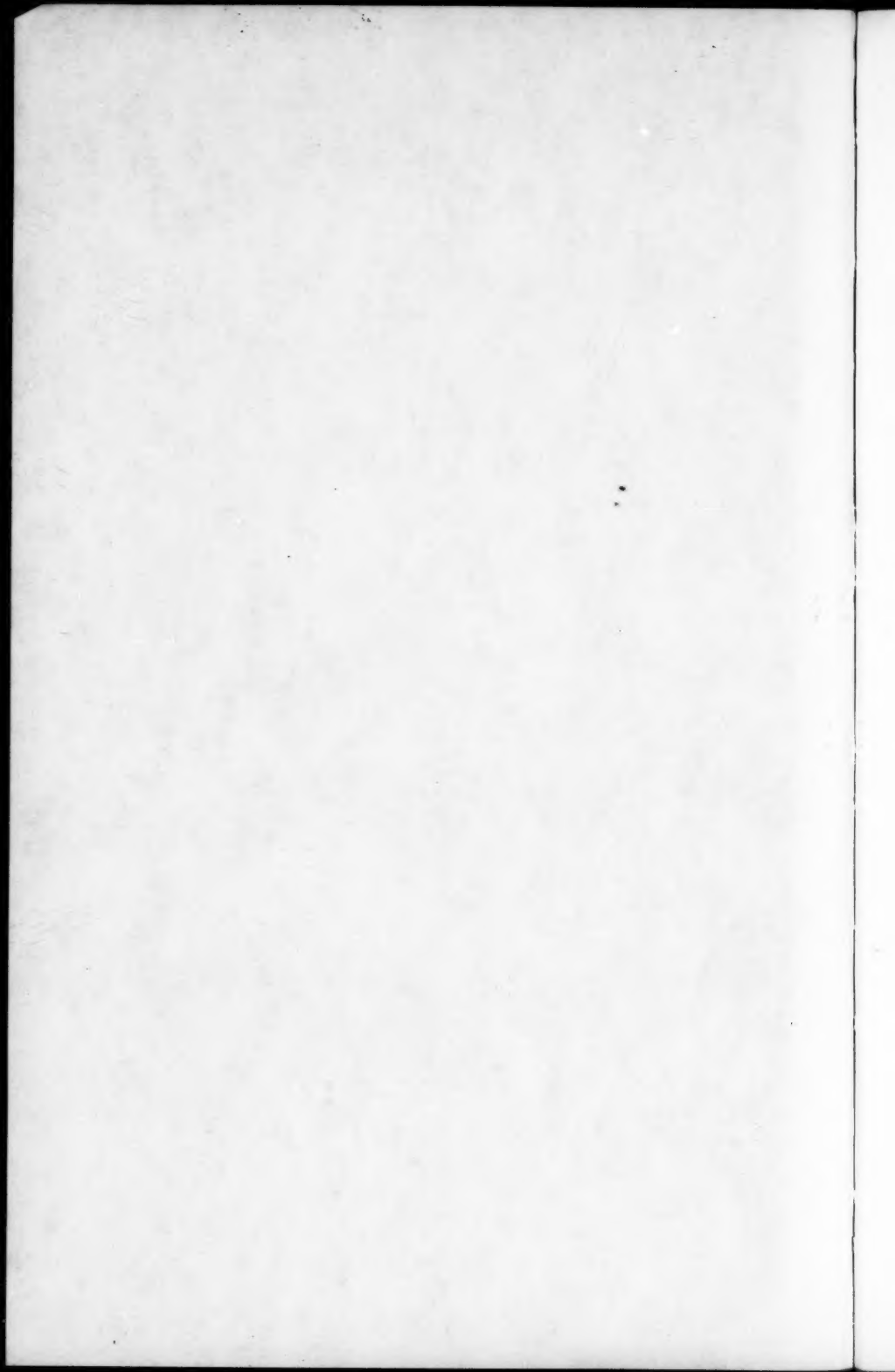
A philosophical conference under the above name is being organized by the provisional committee of the Organisation des Congrès Internationaux pour l'Unité de la Science, and is to be held in Paris from 15 to 23 September. The members of the organizing committee are Carnap, Frank, Jørgensen, Lukasiewicz, Morris, Neurath, Reichenbach, Rougier, Schlick. Philosophical communications and enquiries relating to the subjects before the conference should be addressed Secrétariat pour l'Unité de la Science, Mundaneum Institute, 267 Obrechtstraat, The Hague, Holland: enquiries about membership and accommodation should be addressed Congrès de Philosophie Scientifique, Wagons-Lits, 40 Rue de l'Arcade, Paris VIII.

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